## REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-6 and 8-13 are presently active in this case, Claim 1 having been amended and Claims 7 and 14-18 having been canceled without prejudice or disclaimer by way of the present Amendment.

In the outstanding Official Action, Claims 1, 2, 4, 5, 7, 9, 11, 13, 14, 16, and 17 were rejected under 35 U.S.C. 103(a) as being unpatentable over Geittner et al. (PCVD at High Deposition Rates) in view of Roba (U.S. Patent No. 4,608,070) and Davis (U.S. Patent No. 4,664,689). Claims 1 and 2 were rejected under 35 U.S.C. 103(a) as being unpatentable over the Geittner et al. article in view of Roba, Davis, and Geittner et al. (U.S. Patent No. 5,188,648). For the reasons discussed below, the Applicants traverse the obviousness rejections.

The basic requirements for establishing a *prima facie* case of obviousness as set forth in MPEP 2143 include (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings, (2) there must be a reasonable expectation of success, and (3) the reference (or references when combined) must teach or suggest <u>all</u> of the claim limitations. The Applicants submit that a *prima facie* case of obviousness has not been established in the present case because the references, either taken singularly or in combination, do not teach or suggest all of the claim limitations, and there is

no suggestion or motivation to modify the references to arrive at the presently claimed invention.

Claim 1 of the present application recites a method of manufacturing an optical fibre according to a plasma chemical vapour deposition (PCVD) process by carrying out one or more a chemical vapour deposition reactions in a substrate tube, which method comprises the following steps: i) supplying one or more doped or undoped glass-forming precursors to the substrate tube, ii) supplying a stoichiometric excess of oxygen to the substrate tube, iii) setting up a reaction in the substrate tube between the reactants supplied in steps i) and ii) so as to effect the deposition of one or more glass layers on the interior of the substrate tube, iv) subjecting the substrate tube thus coated in step iii) to a collapsing process so as to form a preform, and finally v) drawing said preform into an optical fibre, wherein the Reynolds number is in accordance with the formula $120<Re<285$ during the deposition process according to step iii), wherein the Reynolds number is calculated on the basis of the reactants supplied to the substrate tube in step i) and step ii), under the temperature and pressure conditions that prevail in the interior of the substrate tube during step iii), wherein a deposition rate of at least 2 g/min is used in step iii).

The Applicants respectfully submit that the cited references, either taken singularly or in combination, do not disclose or suggest all of the limitations recited in Claim 1 of the present application. Thus, a *prima facie* case of obviousness cannot be established for Claim 1.

The Geittner et al. article relates to the production of preforms for optical fibres by means of a PCVD process. Although the Geittner et al. article does not disclose the presently

claimed range of Reynolds numbers, i.e.120 < Re < 285, suitable for a high efficiency PCVD process, the Official Action surmises that this range of Reynolds can be derived from the information described in the Geittner et al. article. The Applicants submit, however, that this conclusion is incorrect.

In Figure 2 of the Geittner et al. article, the minimum inner diameter of the substrate tube to the fourth power $(R_{i,min})^4$ required for a high process yield as a function of the total gas flow $Q_{tot}$ is presented. According to the Geittner et al. article (page 819, left column, 1st paragraph), experimental parameters below the lower limits given in Figure 2 will result in an efficiency $(n_{sio2})$ of below 95 percent.

On page 6, lines 2-8 of the originally filed application, it is disclosed that the present invention relates to a deposition process of the PCVD type having an efficiency of higher than 90% at deposition rates higher than 2 g/min.

Although it is stated that deposition rates up to 3.0 g/min are reported in the Geittner et al. article (page 818, Introduction), no data for the inner diameter of the substrate tube and total gas flow $(Q_{tot})$ are disclosed for deposition rates higher than 2 g/min (Figure 2 of the Geittner et al. article). The Geittner et al. article only provides a suggestion for these deposition rates but fails to support this statement.

The Reynolds number is defined according to the well known formula,

$Re = (\rho \cdot v \cdot d) / \mu$

wherein,

$\rho$ = density [kg/m$^3$]

$v$ = gas speed [m/s]

d = diameter of the tube [m]

$\mu$ = viscosity [pa.s]

From this definition it is clear that in order to calculate the Reynolds number, the diameter of the substrate tube (d) and the total gas flow (for calculation of the speed, $v$) need to be known.

Since in the Geittner et al. article no values for diameter and total gas flow are disclosed for a deposition process with a deposition speed *higher* than 2 g/min, a person skilled in the art cannot determine the Reynolds numbers.

Furthermore, the Geittner et al. article does not provide any pointer to the person of ordinary skill in the art that the efficiency of the deposition process according to the present invention can be characterized by means of Reynolds numbers. The Geittner et al. article is totally silent about the Reynolds numbers.

Examples 2, 3, and 4 as presented in the table on page 7 of the originally filed application, are experiments according to the invention.

Example 2:

The total gas flow for example 2 can be calculated as follows:

$SiCl_4$ flow = 933 sccm (see page 7, line 1);

Oxygen excess = 3 (see page 7, table); and

Total flow = $SiCl_4$ flow + 3 * $SiCl_4$ flow = 933 + 3 * 933 = 3732 sccm.

The inner diameter of the substrate tube was 20 mm as reported on page 6, line 30 of the originally filed application, resulting in a value for the inner diameter to the fourth power ($R^4$) of 1 cm.

If the so determined setpoint is plotted in Figure 2 of the Geittner et al. article, it is observed that this setpoint is well below the line representing the minimum inner diameter of the substrate tube to the fourth power $(R_{i,min})^4$ required for a high process yield as a function of the total gas flow ($Q_{tot}$) according to the Geittner et al. article.

The minimum inner diameter of the substrate tube to the fourth power $(R_{i,min})^4$ for a flow of 3732 sccm namely should be approximately 1.5 $mm^4$ as can be derived from Figure 2 of the Geittner et al. article. This difference of 0.5 $mm^4$ in diameter can be considered significant, and hence a person skilled in the art cannot have learned from the Geittner et al. article what the range of Reynolds numbers according to the present invention should be. In other words, the Geittner et al. article does not teach to apply a Reynolds number in the range of 120-285 as recited in Claim 1 of the present invention.

<u>Example 3:</u>

The total gas flow for example 3 can be calculated as follows:

| | |
|---|---|
| $SiCl_4$ flow | = 933 sccm (see page 7, line 1); |
| Oxygen <u>excess</u> | = 4.5 (see page 7, table); and |
| Total flow | = $SiCl_4$ flow + 4.5 * $SiCl_4$ flow = 933 + 4.5 * 933 = 5131 sccm. |

The inner diameter of the substrate tube was 20 mm as reported on page 6, line 30 of the originally filed application, resulting in a value $R^4$ of 1 cm.

If the so determined setpoint is plotted in Figure 2 of the Geittner et al. article, it is observed that this setpoint is well below the line representing the minimum inner diameter of the substrate tube to the fourth power $(R_{i,min})^4$ required for a high process yield as a function

of the total gas flow ($Q_{tot}$) according to the Geittner et al. article. Furthermore, the $(R_{i,min})^4$ cannot be determined from Figure 2 of the Geittner et al. article.

Thus, a person skilled in the art cannot have learned from the Geittner et al. article what the range of Reynolds numbers according to the present invention should be. Thus, the same argumentation as used above is valid.

Example 4:

The total gas flow for the experiment from example 3 can be calculated as follows:

$SiCl_4$ flow = 933 sccm (see page 7, line 1 );

Oxygen excess = 5 (see page 7, table);

Total flow = $SiCl_4$ flow + 4.5 * $SiCl_4$ flow = 933 + 5 * 933 = 5598 sccm.

The inner diameter of the substrate tube was 20mm as reported on page 6, line 30 of the originally filed application, resulting in a value $R^4$ of 1 cm.

If the so determined setpoint is plotted in Figure 2 from the Geittner et al. article, it is observed that this setpoint is well below the line representing the minimum inner diameter of the substrate tube to the fourth power $(R_{i,min})^4$ required for a high process yield as a function of the total gas flow ($Q_{tot}$) according to the Geittner et al. article.

Furthermore, the $(R_{i,min})^4$ cannot be determined from Figure 2 of the Geittner et al. article.

Thus, a person skilled in the art cannot have learned from the Geittner et al. article what the range of Reynolds numbers according to the present invention should be.

Even assuming that the experimental data as described in the Geittner et al. article

corresponds to values for the Reynolds number that fall within the claimed range for the Reynolds numbers, namely $120 < Re < 285$, the person skilled in the art cannot have learned from the Geittner et al. article that the process boundaries belonging to a high efficiency deposition process at deposition rates above 2 g/min can be defined by means of Reynolds numbers. First of all, the data necessary for calculation of this Reynolds number is not disclosed. Secondly, as is illustrated by means of the description of the examples above, the Geittner et al. article does not unambiguously disclose the total gas flows and inner diameters of the substrate tube that describe these process boundaries.

Regarding the Roba reference, the Roba reference relates to a process for manufacturing preforms for optical fibres, wherein glass particles are produced to make the preform by a reaction of vapour-phase reactants. The particles produced are deposited on the internal surface of a supporting tube rotated around its axis (column 3, lines 14-22)

The present application relates to a plasma chemical vapor deposition (PCVD) process. One of the characteristics of the PCVD process is that glass layers are directly deposited on the internal surface of a tube.

The Roba reference describes in column 4, line 47, to column 5, line 4, that the Reynolds number during deposition should be below 500. The choice of this value relates to the desired thermophoresis effect to occur, where thermophoresis in the Roba reference relates to the movement of the glass particles formed in the vapour phase to the internal surface of the tube.

Because the PCVD process does not concern formation of particles prior to deposition on the internal surface of a tube, the teaching of the Roba reference that the Reynolds number

should be lower than 500, is thus not relevant for the present application.

Thus, there is no motivation or incentive for a person skilled in the art to combine the teachings of the Geittner et al. article and the Roba reference to arrive at the present invention.

Finally, the Davis reference fails to supplement the deficiencies noted above with respect to the Geittner et al. article and the Roba reference. The Davis reference relates to an optical fiber cooler wherein an optical fiber is passed through the axial length of an enclosure having means for passing cryogenic gas through its wall. The Davis reference does not relate to a method of manufacturing optical fiber by carrying out one ore more chemical vapour deposition reactions in a substrate tube. Therefore, the Davis reference does not provide any information about Reynolds numbers, let alone its importance thereof.

The Applicants respectfully submit that the rejection is based on the improper application of hindsight considerations. It is well settled that it is impermissible simply to engage in hindsight reconstruction of the claimed invention, using Applicants' structure as a template and selecting elements from the references to fill in the gaps. *In re Gorman*, 933 F.2d 982, 18 USPQ2d 1885 (Fed. Cir. 1991). Recognizing, after the fact, that a modification of the prior art would provide an improvement or advantage, without suggestion thereof by the prior art, rather than dictating a conclusion of obviousness, is an indication of improper application of hindsight considerations. Simplicity and hindsight are not proper

criteria for resolving obviousness. *In re Warner*, 397 F.2d 1011, 154 USPQ 173 (CCPA 1967).

Accordingly, the Applicants respectfully request the withdrawal of the obviousness rejection of Claim 1.

The dependent claims are considered allowable for the reasons advanced for Claim 1 from which they depend. These claims are further considered allowable as they recite other features of the invention that are neither disclosed nor suggested by the applied references when those features are considered within the context of Claim 1.

Claim 1 and 5 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claims 1 and 12 of copending Application Ser. No. 10/165620 in view of the Geittner et al. article or alternatively in view of the Roba reference.

The Applicants respectfully traverse the provisional obviousness-type double patenting rejection, since pending Claims 1 and 12 of copending Application Ser. No. 10/165620 do not recite a method of manufacturing an optical fibre where the Reynolds number is in accordance with the formula $120<Re<285$ during the deposition process, as recited in Claim 1 of the present application. Furthermore, as discussed above, the Geittner et al. article and the Roba reference both fail to supplement this deficiency. Additionally, it is noted that this rejections is a provisional rejection. Accordingly, the Applicants respectfully request the withdrawal of the provisional obviousness-type double patenting rejection.

Consequently, in view of the above discussion, it is respectfully submitted that the present application is in condition for formal allowance and an early and favorable reconsideration of this application is therefore requested.

Respectfully Submitted,

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